

AMENDMENTS TO THE SPECIFICATION

The following is a complete, marked up listing of the amended paragraphs of the Specification with underlined text indicating insertions, and strikethrough and/or double-bracketed text indicating deletions.

[0014] When the primary silicidation metal is nickel, one or more alloying metals may be selected from a group consisting of tantalum, vanadium, zirconium, hafnium, tungsten, cobalt, platinum, chromium, palladium and niobium, but the total content of the alloying metals will typically constitute no more than about 20 atomic percent of the nickel alloy and may be present at content levels over 0.1 atomic percent. The nickel silicide formation will typically include heating the nickel alloy in contact with a silicon surface to a temperature above about 200 °C. and below about 700 °C., more typically between about 250 °C. and about 500 °C., for a period of at least about 10 seconds and possibly for as long as 30 minutes or more. When using a nickel alloy, particularly a nickel-tantalum alloy, the particular time and temperature combination selected should preferably be sufficient to produce a two-layered nickel silicide structure in which the majority of the nickel is present in the lower layer as NiSi and the majority of the alloying metal has been segregated into the upper layer.

[0038] As illustrated in FIG. 4D, a silicide blocking layer (SBL) 70, typically comprising a silicon oxide layer 67 and a silicon nitride layer 69, is then

formed on the substrate to protect those regions other than the active regions, particularly those regions dedicated to the formation of elements, such as resistors utilized in electrostatic discharge (ESD) protection circuits, that require a higher sheet resistance to operate properly. Although illustrated as a combination of silicon oxide and silicon nitride, the SBL may be formed from a single material, such as silicon nitride, or combinations of other suitable materials as desired. The layer(s) comprising the SBL may be deposited using a chemical vapor deposition (CVD) process, typically at a temperature between about 535 °C. and about 825 °C. For example, CVD silicon nitride may be formed at about 700 °C.

[0041] As illustrated in FIG. 4E, the substrate is typically treated with a HF solution and possibly other substances to remove any native oxide that has formed on the exposed silicon surfaces. After the silicon surfaces have been cleaned, a layer of a silicidation metal or metal alloy 71, such as a nickel/tantalum alloy, and preferably a capping layer (not shown), such as titanium nitride, may then be formed over the reactivated gate structure, LDD and source/drain regions and isolation regions. When forming a nickel silicide, the device may then be annealed at a temperature, typically between about 400 °C. and about 530 °C., and preferably at least above 450 °C., and for a time period sufficient to cause the metal or metal alloy layer ~~30~~71 to react with the exposed silicon of the active region and form a silicide region 71b and/or the gate electrode region and form a silicide region 71a using, for example a rapid thermal anneal (RTP) process. In particular, when forming a nickel silicide, it is preferred that the silicidation temperature not exceed about 550 °C. to suppress formation of the more

resistive tertiary nickel silicide NiSi_2 in favor of the less resistive secondary nickel silicide NiSi .

[0042] Depending on the silicidation metal or metal alloy utilized, the silicidation temperature will be adjusted accordingly to ensure both that the desired silicide is formed substantially completely and that the thermal budget contribution of this process is not excessive. Because the formation of the silicide is largely or completely confined to those regions in which a silicon surface was intentionally exposed prior to the deposition of the nickel alloy 3071, the silicide formation will be considered a self-aligned silicide (salicide).

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